

AMENDMENTS TO THE CLAIMS

Claims 1-3 (Canceled)

Claim 4 (Withdrawn): A method for the formation of a metal film which comprises the steps of bringing a raw material gas containing a halogen into contact with a hot metallic filament and thereby etching the filament with the raw material gas to produce a precursor composed of the metallic component contained in the filament and the halogen contained in the raw material gas; producing an atomic reducing gas by heating a reducing gas to a high temperature; and passing the precursor through the atomic reducing gas to remove the halogen from the precursor and directing the resulting metallic ion or neutral metal onto a substrate to form a thin metal film on the substrate.

Claim 5 (Withdrawn): A method for the formation of a metal film which comprises the steps of bringing a raw material gas containing a halogen into contact with a hot metallic filament and thereby etching the filament with the raw material gas to produce a precursor composed of the metallic component contained in the filament and the halogen contained in the raw material gas; passing a high-frequency electric current through an electrode having openings that allow the precursor to flow therethrough, and thereby converting a reducing gas into a plasma to generate a reducing gas plasma; and passing the precursor through the reducing gas plasma to remove the halogen from the precursor and directing the resulting metallic ion or neutral metal onto a substrate to form a thin metal film on the substrate.

Claim 6 (Canceled)

Claim 7 (Withdrawn): A method for forming a metal film as claimed in claim 4 wherein the step of feeding a raw material gas into an inlet vessel, the step of generating a raw material gas plasma, and the step of producing a precursor comprise the step of bubbling a carrier gas through a liquid organometallic complex and vaporizing the organometallic complex, and the step of etching the perforated plate with the vaporized organometallic complex to produce a precursor composed of the metallic component contained in the perforated plate and the halogen contained in the organometallic complex.

Claims 8-11 (Canceled)

Claim 12 (Withdrawn): An apparatus for the formation of a metal film which comprises a precursor feeding device for bubbling a carrier gas through a liquid organometallic complex, vaporizing the organometallic complex, producing a precursor from the vaporized organometallic complex, and feeding the precursor into a reaction vessel; the reaction vessel housing a substrate; a rotating magnetic field generator for creating a rotating magnetic field in a space above the substrate; and a second plasma generator for generating a plasma from a reducing gas fed into the reaction vessel.

Claim 13 (Withdrawn): An apparatus for the formation of a metal film which comprises a precursor feeding device for bubbling a carrier gas-through a liquid organometallic complex, vaporizing the organometallic complex, producing a precursor from the vaporized organometallic complex, and feeding the precursor into a reaction vessel; the reaction vessel housing a substrate; and an electrode for generating a plasma from a reducing gas fed into the reaction vessel by applying high-frequency electric power thereto.

Claims 14-19 (Canceled)

Claim 20 (Previously Presented): An apparatus for the formation of a metal film, the apparatus comprising:

precursor feeding means for bringing a chlorine-containing raw material gas into contact with a hot metallic filament to produce a precursor within a chamber housing a substrate, the precursor comprising the metallic component contained in the metallic filament and the chlorine contained in the raw material gas;

reducing gas heating means for heating a hydrogen-containing reducing gas to a high temperature and thereby producing an atomic reducing gas within the chamber between the substrate and the precursor feeding means; and

chamber heating means for heating an inner wall of the chamber to a predetermined temperature;

whereby the precursor is passed through the atomic reducing gas within the chamber to remove chlorine from the precursor by reduction, without allowing the precursor to deposit on the heated inner wall of the chamber, and the resulting metallic ion is directed onto the substrate to form a metal film on the substrate.

Claims 21-23 (Canceled)

Claim 24 (Withdrawn): A method for the formation of a metal film which comprises reacting chlorine with a metallic plate within a chamber to produce a precursor composed of a metallic component and chlorine, removing chlorine from the precursor by reduction, and directing the resulting metallic ion onto a substrate within the chamber to form a metal film on the substrate, the method being characterized in that the chamber is heated to a predetermined temperature so as to prevent the precursor from depositing on the inner wall of the chamber.

Claim 25 (Withdrawn): A method for the formation of a metal film which comprises reacting chlorine with a metallic plate within a chamber to produce a precursor composed of a metallic component and chlorine, removing chlorine from the precursor by reduction, and directing the resulting metallic ion onto a substrate within the chamber to form a metal film on the substrate, the method being characterized in that the metallic plate is heated to a predetermined temperature so as to make the precursor easy to reduce.

Claim 26 (Withdrawn): A method for the formation of a metal film which comprises reacting chlorine with a metallic plate within a chamber to produce a precursor composed of a metallic component and chlorine, removing chlorine from the precursor by reduction, and directing the resulting metallic ion onto a substrate within the chamber to form a metal film on the substrate, the method being characterized in that the chamber is heated to a predetermined temperature so as to prevent the precursor from depositing on the inner wall of the chamber and, moreover, the metallic plate is heated to a predetermined temperature so as to make the precursor easy to reduce.

Claim 27 (Withdrawn): A method for the formation of a metal film as claimed in claim 24 wherein the metal plate is made of copper, so that Cu_xCl_y is produced as the precursor.

Claim 28 (Withdrawn): A method for the formation of a metal film as claimed in claim 27 wherein the predetermined temperature to which the metallic plate is heated is in the range of 200 to 800°C.

Claims 29-32 (Canceled)

Claim 33 (Withdrawn): An apparatus for the formation of a metal film, the apparatus comprising:

- a reaction vessel in which a substrate to be treated is placed;
- a raw material gas feed pipe inserted into said inlet vessel for feeding chlorine or hydrogen chloride;
- a spiral tube attached to the inner end of said raw material gas feed pipe, having a raw material gas flow passage whose inner surface is made of copper, and equipped with a heating element;
- atomic reducing gas producing means for producing an atomic reducing gas within said reaction vessel, at least in the neighborhood of said substrate to be treated; and
- evacuation means for evacuating any gas from said reaction vessel and said raw material gas flow passage.

Claim 34 (Withdrawn): An apparatus for the formation of a metal film as claimed in claim 33 wherein said spiral tube equipped with a heating element has a dual tubular structure consisting of an outer tube and an inner copper tube inserted into said outer tube and used as a flow passage for the raw material gas, and a heating medium is made to flow through the space between said outer tube and said inner copper tube.

Claim 35 (Withdrawn): An apparatus for the formation of a metal film as claimed in claim 33 wherein said spiral tube equipped with a heating element has a structure consisting of a copper tube and a tubular heater disposed around said copper tube with a tubular insulator interposed therebetween.

Claim 36 (Withdrawn): A method for forming a metal film as claimed in claim 5 wherein the step of feeding a raw material gas into an inlet vessel, the step of generating a raw material gas plasma, and the step of producing a precursor comprise the step of bubbling a carrier gas through a liquid organometallic complex and vaporizing the organometallic complex, and the step of etching the perforated plate with the vaporized organometallic complex to produce a precursor composed of the metallic component contained in the perforated plate and the halogen contained in the organometallic complex.

Claim 37 (Withdrawn): A method for the formation of a metal film as claimed in claim 25 wherein the metal plate is made of copper, so that Cu_xCl_y is produced as the precursor.

Claim 38 (Withdrawn): A method for the formation of a metal film as claimed in claim 26 wherein the metal plate is made of copper, so that Cu_xCl_y is produced as the precursor.